

## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
13 May 2004 (13.05.2004)

PCT

(10) International Publication Number  
**WO 2004/040000 A2**

(51) International Patent Classification<sup>7</sup>: **C12Q**  
(21) International Application Number:  
PCT/US2003/028226  
(22) International Filing Date:  
9 September 2003 (09.09.2003)

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(25) Filing Language: English

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(26) Publication Language: English

(30) Priority Data:  
60/409,303 9 September 2002 (09.09.2002) US  
60/461,329 9 April 2003 (09.04.2003) US

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,  
CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE,  
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TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(63) Related by continuation (CON) or continuation-in-part  
(CIP) to earlier applications:

US 60/409,303 (CIP) ✓  
Filed on 9 September 2002 (09.09.2002)  
US 60/461,329 (CIP) ✓  
Filed on 9 April 2003 (09.04.2003)

(84) Designated States (*regional*): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,  
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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## Published:

- without international search report and to be republished  
upon receipt of that report
- with sequence listing part of description published sepa-  
rately in electronic form and available upon request from  
the International Bureau

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ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: G PROTEIN COUPLED RECEPTORS AND USES THEREOF

(57) Abstract: The present invention provides GPCR polypeptides and polynucleotides, recombinant materials, and transgenic mice, as well as methods for their production. The polypeptides and polynucleotides are useful, for example, in methods of diagnosis and treatment of diseases and disorders. The invention also provides methods for identifying compounds (e.g., agonists or antagonists) using the GPCR polypeptides and polynucleotides of the invention, and for treating conditions associated with GPCR dysfunction with the GPCR polypeptides, polynucleotides, or identified compounds. The invention also provides diagnostic assays for detecting diseases or disorders associated with inappropriate GPCR activity or levels.

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## REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

PCT/US03/28226

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PCT/US 03/28226

International Application No.

International Filing Date

09.09.03 09 SEP 2003

PCT INTERNATIONAL  
APPLICATION RO/US

Name of receiving Office and "PCT International Application"

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(if desired) (12 characters maximum) 50001/007WO3

<b>Box No. I TITLE OF INVENTION</b> G PROTEIN COUPLED RECEPTORS AND USES THEREOF	
<b>Box No. II APPLICANT</b> <input type="checkbox"/> This person is also inventor	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) PRIMAL, INC. 1124 Columbia Avenue Seattle, WA 98104 United States of America	
Telephone No. Facsimile No. Teleprinter No. Applicant's registration No. with the Office	
State (that is, country) of nationality: US	State (that is, country) of residence: US
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This person is: <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.) Applicant's registration No. with the Office	
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<input checked="" type="checkbox"/> Further applicants and/or (further) inventors are indicated on a continuation sheet.	
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The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: <input checked="" type="checkbox"/> agent <input type="checkbox"/> common representative	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) ELBING, Karen L. Clark & Elbing LLP 101 Federal Street Boston, MA 02110 United States of America	
Telephone No. (617) 428-0200 Facsimile No. (617) 428-7045 Teleprinter No. N/A Agent's registration No. with the Office 35,238	
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**BERGMANN, John E.**  
**9440 SE 70th Place**  
**Mercer Island, WA 98040**  
**United States of America**

This person is:

- ☐ applicant only  
☒ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
**US**

State (that is, country) of residence:  
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This person is applicant for the purposes of:

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Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

**GRAGEROV, Alexander**  
**4427 Williams Avenue W.**  
**Seattle, WA 98199**  
**United States of America**

This person is:

- ☐ applicant only  
☒ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
**RU**

State (that is, country) of residence:  
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Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

**HOHMANN, John**  
**P.O. Box 1000**  
**Laconner, WA 98257**  
**United States of America**

This person is:

- ☐ applicant only  
☒ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
**US**

State (that is, country) of residence:  
**US**

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

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**LI, Fusheng**  
**3818 NE 75th Street, #3**  
**Seattle, WA 98115**  
**United States of America**

This person is:

- ☐ applicant only  
☒ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
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State (that is, country) of residence:  
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**Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)**

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Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

MADISEN, Linda  
2017 Fairview Avenue E., M  
Seattle, WA 98102  
United States of America

This person is:

- ☐ applicant only  
☒ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
US

State (that is, country) of residence:  
US

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

MCILWAIN, Kellie L.  
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Renton, WA 98056  
United States of America

This person is:

- ☐ applicant only  
☒ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
US

State (that is, country) of residence:  
US

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

PAVLOVA, Maria N.  
5000 22nd Avenue NE, Apt. #314  
Seattle, WA 98105  
United States of America

This person is:

- ☐ applicant only  
☒ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
RU

State (that is, country) of residence:  
US

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

VASSILATIS, Demetri  
740 Bellevue Avenue East, #604  
Seattle, WA 98102  
United States of America

This person is:

- ☐ applicant only  
☒ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
GR

State (that is, country) of residence:  
US

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on another continuation sheet.

**Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)**

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ZENG, Hongkui  
15015 Dayton Avenue N.  
Shoreline, WA 98133  
United States of America

This person is:

- ☐ applicant only  
☒ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:  
US

State (that is, country) of residence:  
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This person is applicant for the purposes of:

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This person is:

- ☐ applicant only  
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☐ inventor only (If this check-box is marked, do not fill in below.)

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State (that is, country) of nationality:

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☐ inventor only (If this check-box is marked, do not fill in below.)

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This person is applicant for the purposes of:

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  - (iii) *if, in Box No. II or in any of the sub-boxes of Box No. III, the inventor or the inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the inventor(s) and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;*
  - (iv) *if, in addition to the agent(s) indicated in Box No. IV, there are further agents: in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box No. IV;*
  - (v) *if, in Box No. V, the name of any State (or OAPI) is accompanied by the indication "patent of addition," or "certificate of addition," or if, in Box No. V, the name of the United States of America is accompanied by an indication "continuation" or "continuation-in-part": in such case, write "Continuation of Box No. V" and the name of each State involved (or OAPI), and after the name of each such State (or OAPI), the number of the parent title or parent application and the date of grant of the parent title or filing of the parent application;*
  - (vi) *if, in Box No. VI, there are more than five earlier applications whose priority is claimed: in such case, write "Continuation of Box No. VI" and indicate for each additional earlier application the same type of information as required in Box No. VI.*
2. *If, with regard to the precautionary designation statement contained in Box No. V, the applicant wishes to exclude any State(s) from the scope of that statement: in such case, write "Designation(s) excluded from precautionary designation statement" and indicate the name or two-letter code of each State so excluded.*

**CONTINUATION OF BOX NO. V**

Continuation-in-part of U.S. Provisional Patent Application Nos. 60/409,303 filed 09 September 2002 (09.09.02) and 60/461,329 filed 09 April 2003 (09.04.03)

**Box No. VI PRIORITY CLAIM**

The priority of the following earlier application(s) is hereby claimed:

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country or Member of WTO	regional application:* regional Office	international application: receiving Office
item (1) 09 September 2002 (09.09.02)	60/409,303	US		
item (2) 09 April 2003 (09.04.03)	60/461,329	US		
item (3)				
item (4)				
item (5)				

☐ Further priority claims are indicated in the Supplemental Box.

The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of this international application is the receiving Office) identified above as:

☐ all items ☒ item (1) ☒ item (2) ☐ item (3) ☐ item (4) ☐ item (5) ☐ other, see Supplemental Box

\* Where the earlier application is an ARIPO application, indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed (Rule 4.10(b)(ii)): . . . .

**Box No. VII INTERNATIONAL SEARCHING AUTHORITY**
**Choice of International Searching Authority (ISA)** (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA / US

**Request to use results of earlier search; reference to that search** (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year)

Number

Country (or regional Office)

**Box No. VIII DECLARATIONS**

The following declarations are contained in Boxes Nos. VIII (i) to (v) (mark the applicable check-boxes below and indicate in the right column the number of each type of declaration):

Number of  
declarations

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> Box No. VIII (i)   | Declaration as to the identity of the inventor   | : |
| <input type="checkbox"/> Box No. VIII (ii)  | Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent             | : |
| <input type="checkbox"/> Box No. VIII (iii) | Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application | : |
| <input type="checkbox"/> Box No. VIII (iv)  | Declaration of inventorship (only for the purposes of the designation of the United States of America)                               | : |
| <input type="checkbox"/> Box No. VIII (v)   | Declaration as to non-prejudicial disclosures or exceptions to lack of novelty   | : |



**Box No. IX CHECK LIST; LANGUAGE OF FILING**

This international application contains:

(a) in paper form, the following number of sheets:

request (including declaration sheets) : 8  
description (excluding sequence listings and/or tables related thereto) : 359  
claims : 173  
abstract : 1  
drawings : 9

Sub-total number of sheets : 550

sequence listings :  
tables related thereto :

(for both, actual number of sheets if filed in paper form, whether or not also filed in computer readable form; see (c) below)

Total number of sheets : 550

(b) ☒ only in computer readable form (Section 801(a)(i))

(i) ☐ sequence listings  
(ii) ☒ tables related thereto

(c) ☐ also in computer readable form (Section 801(a)(ii))

(i) ☐ sequence listings  
(ii) ☐ tables related thereto

Type and number of carriers (diskette, CD-ROM, CD-R or other) on which are contained the

☐ sequence listings: .....

☒ tables related thereto: CD-R .....

(additional copies to be indicated under items 9(ii) and/or 10(ii), in right column)

This international application is accompanied by the following item(s) (mark the applicable check-boxes below and indicate in right column the number of each item):

- |  |   |                  |
|--|---|------------------|
| 1. <input checked="" type="checkbox"/> fee calculation sheet   | : |                  |
| 2. <input type="checkbox"/> original separate power of attorney  | : |                  |
| 3. <input type="checkbox"/> original general power of attorney   | : |                  |
| 4. <input type="checkbox"/> copy of general power of attorney; reference number, if any: .....   | : |                  |
| 5. <input type="checkbox"/> statement explaining lack of signature   | : |                  |
| 6. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): .....  | : |                  |
| 7. <input type="checkbox"/> translation of international application into (language): .....  | : |                  |
| 8. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material   | : |                  |
| 9. <input type="checkbox"/> sequence listings in computer readable form (indicate type and number of carriers)   | : |                  |
| (i) <input type="checkbox"/> copy submitted for the purposes of international search under Rule 13ter only (and not as part of the international application):   | : |                  |
| (ii) <input type="checkbox"/> (only where check-box (b)(i) or (c)(i) is marked in left column) additional copies including, where applicable, the copy for the purposes of international search under Rule 13ter                         | : |                  |
| (iii) <input type="checkbox"/> together with relevant statement as to the identity of the copy or copies with the sequence listings mentioned in left column   | : |                  |
| 10. <input checked="" type="checkbox"/> tables in computer readable form related to sequence listings (indicate type and number of carriers)   | : |                  |
| (i) <input type="checkbox"/> copy submitted for the purposes of international search under Section 802(b-quater) only (and not as part of the international application)   | : |                  |
| (ii) <input checked="" type="checkbox"/> (only where check-box (b)(ii) or (c)(ii) is marked in left column) additional copies including, where applicable, the copy for the purposes of international search under Section 802(b-quater) | : | 2 CD-R           |
| (iii) <input checked="" type="checkbox"/> together with relevant statement as to the identity of the copy or copies with the tables mentioned in left column   | : | (CD Transmittal) |
| 11. <input checked="" type="checkbox"/> other (specify): Transmittal Letter, Check (\$13,016) & Postcard:  | : |                  |

Figure of the drawings which should accompany the abstract: NONE

Language of filing of the international application: ENGLISH

**Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE**

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

for PRIMAL, INC. et al.

Michael J. Belliveau, Ph.D.

for Karen L. Elbing, Ph.D.

(09.09.03)

1. Date of actual receipt of the purported international application:		DT20 Rec'd PCT/PTO 09 SEP 2003		2. Drawings:	
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:				<input type="checkbox"/> received:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):				<input type="checkbox"/> not received:	
5. International Searching Authority (if two or more are competent): ISA /US		6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid			

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

This sheet is not part of and does not count as a sheet of the international application.

# PCT

## FEE CALCULATION SHEET

Annex to the Request

For receiving Office use only

### PCT/US 03/28226

International Application No.

09.09.03  
Date stamp of the receiving Office

09 SEP 2003

Applicant's or agent's  
file reference

50001/007WO3

Applicant

PRIMAL, INC. et al.

### CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE

240 T

2. SEARCH FEE

700 S

International search to be carried out by

ISA/US

(If two or more International Searching Authorities are competent to carry out the international search, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

#### Basic Fee

Where items (b) and/or (c) of Box No. IX apply, enter Sub-total number of sheets } 550

Where items (b) and (c) of Box No. IX do not apply, enter Total number of sheets }

b1 first 30 sheets 476 b1

b2 520 x 12 = 6,240 b2  
number of sheets in excess of 30 fee per sheet

b3 additional component (only if sequence listings and/or tables related thereto are filed in computer readable form under Section 801(a)(i), or both in that form and on paper, under Section 801(a)(ii)):

400 x 12 = 4,800 b3  
fee per sheet

Add amounts entered at b1, b2 and b3 and enter total at B 11,516 B

#### Designation Fees

The international application contains 98 designations.

5 x 104 = 520 D  
number of designation fees payable (maximum 5) amount of designation fee

Add amounts entered at B and D and enter total at I 12,036 I

(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

4. FEE FOR PRIORITY DOCUMENT (if applicable)

40 P

5. TOTAL FEES PAYABLE

13,016

Add amounts entered at T, S, I and P, and enter total in the TOTAL box

TOTAL

☐ The designation fees are not paid at this time.

### MODE OF PAYMENT

☐ authorization to charge  
deposit account (see below)

☐ postal money order

☐ cash

☐ coupons

☒ cheque

☐ bank draft

☐ revenue stamps

☐ other (specify):

### AUTHORIZATION TO CHARGE (OR CREDIT) DEPOSIT ACCOUNT

(This mode of payment may not be available at all receiving Offices)

☐ Authorization to charge the total fees indicated above.

☒ (This check-box may be marked only if the conditions for deposit accounts of the receiving Office so permit) Authorization to charge any deficiency or credit any overpayment in the total fees indicated above.

☐ Authorization to charge the fee for priority document.

Receiving Office: RO/ US

Deposit Account No.: 03-2095

Date: September 9, 2003

Name: Michael J. Belliveau, Ph.D.

Name: for Karen J. Elbing, Ph.D.

Signature: *[Signature]*